HOT-AIR OVENS FOR IRON FURNACES.

We commence, this week, a series of most interesting and useful articles on the above subject, taken from a paper read before the Institution of Mechanical Engineers, and which we condense from the London *Engineer:*

The first idea of heating the blast, prior to its entrance through the tuyeres into the furnace, is due, as is now universally admitted, to Mr. Neilson, of Glasgow, who also has the merit of its first practical application early in the year 1829. Previous to that period, the settled and firm conviction of iron-masters appears to have been that the colder the blast the better the quality, and the larger the quantity of iron produced from each furnace in a given time. This conviction was the result of long-continued observations, which showed that the produce per furnace was always more in winter than in summer; and as the difference most appreciable to the furnace-managers between the one state of circumstances and the other was the temperature of the atmosphere, this, without further investigation, was at once charged as the sole cause. Subsequent research, however, has shown that the mere variation of temperature in the atmosphere from freezing point to summer heat had nothing to do with this result, which is owing to a cause still as actively in operation and as sensibly felt with the blast heated to a temperature of 600° or 800° Fah., namely, the excess of moisture, in the shape of invisible vapor, contained in the air in the warm weather as compared with the cold. So strongly rooted, however, was the belief that the temperature was the only circumstance affecting the make of iron, that the greatest efforts were made in summer to obtain the blast as cool as possible; among other plans, by passing it over cold water, with a result, of course, contrary to expectation, owing to a partial absorption of the water. On this point, some most interesting evidence was adduced at the instance of Mr. Neilson, in the great hot-blast trial at Edinburgh, in 1843, when all the leading and most experienced iron-masters of the Staffordshire district—Mr. W. H. Sparrow, of Stowheath; the late Mr. James Forster, of Stourbridge; the late Mr. Barker, of the Chillington Works; and the late Mr. Ward, of Priestfield—stated it as a fact that, previous to the introduction of hot-blast, the universal opinion of furnace-managers was that the colder the blast the greater the produce of the furnace.

This being the state of practice, and this the state of the science and opinion of men of skill in the iron trade, it occurred to Mr. Neilson, who was fortunately out of the iron trade, and consequently unencumbered with either its practice or its prejudices, that the power of the blast in igniting the materials would be greatly increased if, in its passages to the tuyeres, it were heated to a very considerable temperature. This idea was the result of careful and laborious thought on facts which came under his observation at the gas-works at Glasgow, with which he was connected. Having convinced himself, by experiment on a small scale, of the correctness of the idea, he at once set about embodying it in a practical shape, the first application of the plan being at the Clyde Ironworks, Glasgow, early in 1829. By the kindness of Mr. Neilson, the writer was able to present the institution, with a correct drawing of the apparatus then first made use of, which is show in Fig. 1. It consisted of a small wrought-iron heating-chamber, A, about 4 feet long, 3 feet high, and 2 feet wide, in construction similar to a wagon-head steam-boiler, which was set in brick-work with a grate, B, below, similar, in all respects, to the ordinary steam-boiler. The cold-blast entered at the end immediately over the grate, and passed out to the tuyere from the other end, being warmed in its passage along the chamber to a temperature of about 200° Fah. There was one of these heating-chambers to each tuyere; the total area of fire-grate per tuyere was about four square feet, and the area of heating surface of the chamber, 35 square feet. This apparatus, although very imperfect, and capable of raising the temperature of the blast to a very moderate degree only, was yet a very successful beginning; and the result produced in the blast-furnace soon proved that the idea was one destined to work a vast change.

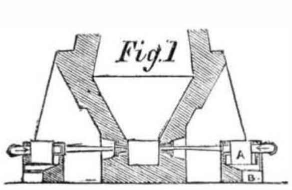


Fig.1

Although this first application of hot-blast may now appear crude, it is doubtful whether, if divested of all subsequently acquired experience, any better or more practical mode of testing the invention would have occurred to any of us: so difficult is it to invent, so easy to see defects afterwards. The latter facility soon became apparent to Mr. Neilson, for the boiler-plate chamber shortly succumbed to the heat and oxydation, and called for renewal. This being rather an expensive process, he began to look out for something more durable; and here, fortunately, his experience in gas-making came to his aid; for, finding that the cast-iron gas retorts both endured a higher temperature and lasted longer under more trying circumstances than the boiler-plate chamber. he at once resolved to substitute a cast-iron retort-shaped heating vessel. This is shown in Fig. 2, and was found to be a great improvement on the original plan, lasting longer, and raising the temperature of the blast to about 280° Fah. It was constructed at the Clyde Works, about the latter part of 1829. It consisted of a cylindrical cast-iron tube, A, bottle-shaped at each end, for the admission and discharge of the blast, about 2 feet 9 inches diameter, and 6 feet long. As in the former case, there was one of these heating vessels to each tuyere; but the heating surface was increased to 55 square feet per tuyere, or one and a half times the surface exposed to the first application; and the grate area was increased to 11 square feet, or nearly three times. In the previous case, it will be observed that the top of the wrought-iron chamber was exposed to the atmosphere, thus leading to a great waste of heat. But in this second case a great improvement was made in the mode of setting, the heating vessel being wholly enclosed within the brick casing over the fire, thus preventing any waste of heat, and producing, with the increased heating and grate surface, the increase of temperature from 200° to 280° Fah.

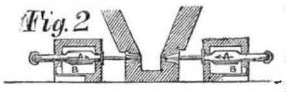


Fig. 2

Having thus discovered the great advantage of this mode of setting the heating-chamber entirely within the flue, but being still dissatisfied with the result at present obtained, and bent on further improvement, Mr. Neilson designed the greatly improved apparatus shown in Fig. 3, plan view, which was erected at the Clyde Works in 1830. In this plan there is a great extension of the previous idea. Instead of one grate per tuyere, of 11 square feet, there are here five grates, B B, for two tuyeres, giving an area of 28 square feet of surface per tuyere. The solitary tubular heating-chamber over the grate is here lengthened out into a continuous pipe, A, 18 inches diameter, enclosed in long lengths of flue, extending to a total length of about 100 feet, giving 240 square feet area of heating surface per tuyere. Much ingenuity is displayed in the arrangement and setting of both the grates, pipes and flues of this apparatus; and it was attended with great success in raising the temperature of the blast to more than 600° Fah., so as to melt lead. This may be called the first example of really hot-blast being obtained.

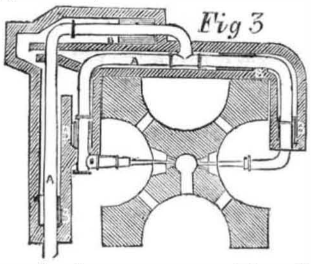


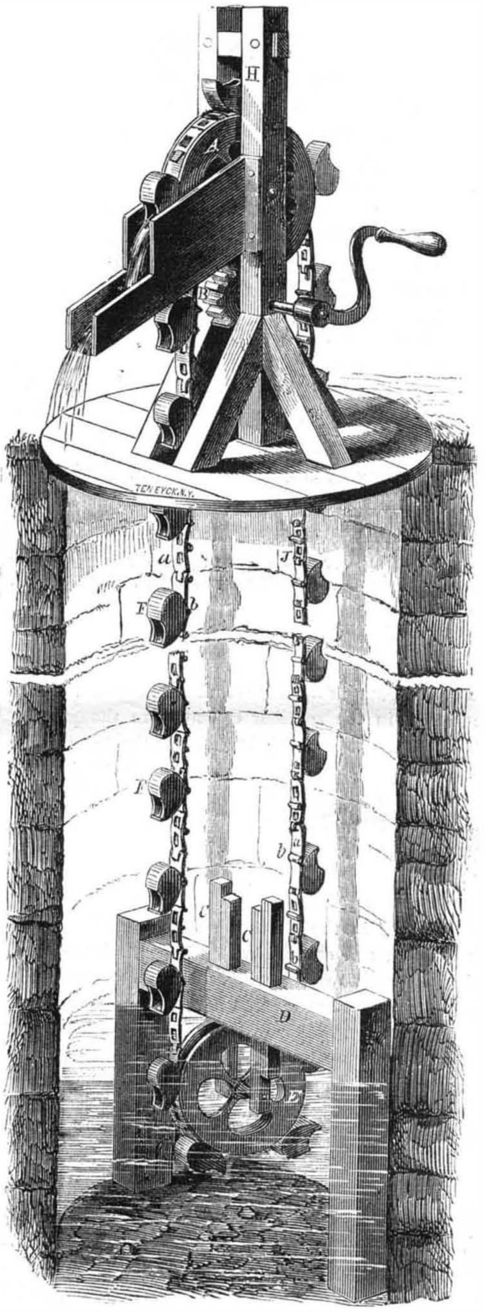
Fig 3

Defects, however, soon began to manifest themselves. With the lengthening of the heating tubes, and the greater general complication of the apparatus, a difficulty had now crept in unawares, destined to be highly mischievous, and to test the ingenuity of a whole generation of furnace-managers. It arose from irregular and uncompensated expansion and contraction, inducing that serious defect of hot-blast ovens, leaky joints. With the present experience in these matters, it will be seen at once how very open an apparatus of the above construction would be to such a defect; the great length of pipe expanding and contracting to a perceptible extent at every change of temperature, and consequently straining every branch, bend and joint of the whole range. The leakage at the joints was to some extent overcome by covering them with a ring of cast-iron; followed, as a result, by the breaking of the pipes, a defect of greater magnitude. The very great improvement which took place in both the produce and the yield of the furnace, consequent on the increased temperature of the blast, made it necessary to set seriously to work to overcome the new difficulty, and to construct an apparatus capable of maintaining the heat of the blast uniformly at this increased high temperature, without leakage or breakage of the pipes.

[To be continued.]

IMPROVED HYDRAULIC ELEVATOR.

The great fault of water elevators which are attached to an endless chain, is that they do not raise enough for the amount of labor expended; they are too wasteful, as they afford so many opportunities for leakage during the passage of the water from the cistern to the spout. The subject of our engraving overcomes this difficulty in two ways: first, by having the buckets in such a shape as to retain all the water received until the proper time to discharge it into the spout; and, secondly, by preventing any shaking of the buckets in their passage up, by making the chain in such a manner as to ensure its rigidity.



On the top of the well a frame, H, is mounted, carrying a flanged wheel, A, provided with cogs between the flanges, so that it can be rotated by another cogged-wheel, B, and crank handle, I, below it. In the bottom of the well is another frame, D, in which a flanged guide-pulley, E, is secured by double-beveled keys, C. An endless chain, J, formed of curved links, *a*, having projections, *b*, upon their backs, which fit into the spaces between the cogs on the flanged wheel, A, so that certainty and steadiness of rotation is secured. The buckets are of the form shown, the mouth being protected by a sort of scoop or spout, which holds the water when the bucket is in a horizontal position, and does not allow any to escape until the mouth has acquired a considerable inclination downwards; but the curve of the mouth of the bucket is not so great as to retain any water that should be discharged into the spout, G. With this pump, there is no liability of splashing so as to rust the wheels or

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nails in the framing; and with it, water can be elevated to any height, or from the deepest well. The invention is also applicable to ship's pumps, by having the ends of the shaft of the lower wheel to move in a groove, which is an arc of a circle with the axle of A for a center, and a weight attached to the lower shaft to keep the two sides of the endless chain perpendicular during the motion of the ship, so that the buckets will retain their contents until they arrive at the discharge spout.

The inventor is D. Du Pre, of Raleigh, N. C., and he will be happy to give any further information, upon being communicated with. The patent is dated June 7, 1859.

CANNEL COAL.

The constituents of this coal are carbon, hydrogen, oxygen, nitrogen, potash, some silica,, and occasionally a trace of sulphur. When it is subjected to dry distillation, the equilibrium of these elements is disturbed, and new combinations take place. Hydrogen and oxygen readily vaporize, and from affinity unite, forming compounds, partly with each other, partly with carbon, either singly or in conjunction. If not interfered with by some other agent, in combining they form water; while the excess of hydrogen takes up carbon according to the temperature, forming olefiant gas, carbureted and bicarbureted hydrogen, while other compounds result from the common action of the other elements on the remaining carbon. The different gases evolved from the still condense to a liquid in the worm, and are subsequently purified in various ways, as they are successively produced under different temperatures. The first liquid is *naphtha*, a light, volatile, and very inflammable oil, which is used as a vehicle for resins, such as india-rubber, &c., in varnishes; for extracting perfumes from flowers; and which may be converted into benzole, an oil preferable to alkalies for separating fatty oils and grease from wool, silk, &c., since it does not injure the colors, and is free from resinous impurities. In combination with nitric acid, *nitro-benzole* is formed, which can replace the oil of bitter almonds in perfumery. The next oil appearing is a light oil, now extensively used for illumination, "kerosene," "coal oil," or "carbon oil." It is not explosive, and has the property of preventing decay in wood impregnated with it. On redistillation *creosote* or *carbolic acid* is produced, which prevents decomposition in meat and other organizations. From *creosote* another fluid is extracted, *carboazotic acid*, which gives a beautiful and permanent straw-yellow color to silks and other fabrics, and has been successfully used as a febrifuge. The third substance produced is a heavy, fatty oil, which, when refined, under the name of lubricating oil, is extensively used for machinery, and which, by the action of cold yields *paraffine*, a beautiful white crystallized substance, which, when subjected to pressure, forms candles superior to sperm. From this heavy oil may also be extracted *anyline*, which, in combination with other agents, gives a blue dye equal to indigo, or a fine red. The coke remaining after these processes, besides its use as fuel, when left long in contact with iron, yields a fine plumbago. The ammonia obtained in distillation may be used as a rich fertilizing agent, mixed with plaster, or lime.

KYANIZED TIMBER.

We have frequently directed the attention of our railroad companies to the benefit that would accrue to them by the use of kyanized timber for sleepers and bridges. A correspondent of the *Railway Times* cites a case in which the benefit of such prepared timber has been very fully demonstrated, he says:—"The best proof of its value, however, is furnished by the aqueduct of the Alexandria Canal over the Potomac river at Georgetown, D. C. The whole of that structure, with the exception of the oak posts in the trusses, is built of Carolina pine, which as well as those posts, was all kyanized. A more severe test of the efficacy of that mode of preserving timber could not be devised than it is there subjected to, and has been for 16 years, As in all such structures, the leakage is considerable, and much of the timber in it is wet during the season for navigation, and at other times dry, while at all times it is exposed to the vicissitudes of the weather. Upon a recent inspection, the Carolina wood was found to be perfectly sound; and the same may be said of the oak posts, excepting in cases where they were crushed or split by the enormous weight upon them, though they were unseasoned when kyanized."

HOWELL'S IMPROVED RETAINING HINGE.

This hinge retains the shutter to which it may be attached in either of the two positions, open or closed, and does not permit of the connections being shaken out by the rattling of the shutters by the wind or other force, and also prevents the unpleasant noise produced by the same cause.

Fig. 1 shows the hinge, A being the portion screwed or otherwise attached to the wall or jamb of the house, and B is the portion screwed to the shutter. The two halves of the hinge are fitted together at *x*, and are enlarged at the ends where they meet. Through these enlarged ends passes a pin or bolt, seen in the section, Fig. 3. The pin is round on that portion which passes through the round hole in the part, B, and square where it passes through the square hole in the lower part, A, so that it is prevented turning in the lower half. Its lower end is round, and is furnished with a nut, *a*, which can move freely in a recess in the half, A, and a spiral spring, *f*, is placed so as to bear with one end against the top of the recess and with the other against the nut, *a*, thereby tending to depress the bolt. The head of the bolt has on its under side a notch, one side of which is vertical and the other side inclined. A projection, *i*, on the portion of the hinge, B, corresponds to the notch on the head of the bolt. This notch and projection are so arranged that when the shutter is placed back against the wall, as in Fig. 2, the projection will drop into the notch. Only one hinge of a shutter has occasion to be constructed in this way, the other one may be of the ordinary kind. As the shutter with the half, B, of the hinge is being opened, the inclined edge of the projection, *i*, bears against the inclined edge of the notch on the bolt, the latter gradually rising until the shutter is folded back against the wall, when the bolt, by the reaction of the spiral spring, will fit into the notch, thus retaining the shutter in its position. When the shutter has to be closed, all that is necessary is to apply the finger to the lower end of the bolt, thereby raising the latter, when the shutter is at liberty to be turned away from the wall.

Fig. 1

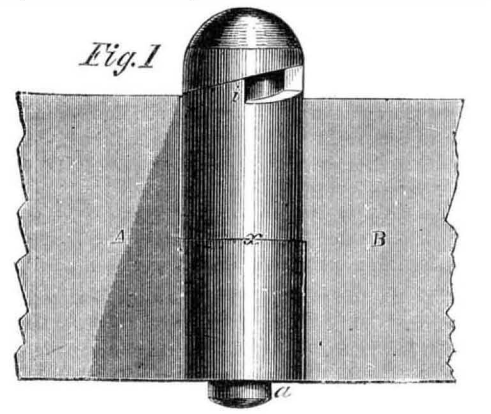


Fig. 2

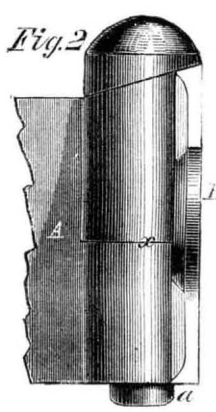
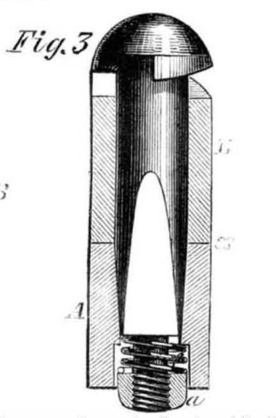


Fig. 3



This great improvement, which is also applicable to doors and gates that have to be held back, is the invention of Levi T. Howell, of Burlington, N. J., and any further information can be obtained by addressing DeWitt C. Taylor, Philadelphia, Pa. The patent is dated April 26, 1859.

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The Crops.—A correspondent writing from Indiana says, "The wheat crop which is now being rapidly taken to market, is fine, perhaps better than we have had for four years past: price 85 and 90 cents per bushel at the warehouse. Corn is looking fine, and there will probably be an abundant crop." This seems to be the case in reference to the whole corn crop of the country.

PAINTS FOR ROOFING AND OTHER PURPOSES.

Messrs. Editors:—A company in Philadelphia, Pa., are introducing into this city what they call a new metallic paint, which is stated to be mixed in a peculiar way, and that it is a permanent and valuable covering for metallic roofs, much more so than any of the other paints which are now used for this purpose. A new name given to fruit does not improve its flavor, neither does a new name improve the qualities of an old paint. The paint spoken of above, shows, by a quantitative analysis, that its composition, when first ground, is:—

Linseed oil	20
Graphite (blacklead)	80
	100

This is an old paint; we have used it many years; and we have more than a tun on hand at present. It is a good paint for iron roofs, ships' bottoms, &c., but not good for copper, or new tin. The chemical action on paints, of iron, copper, and tin, is very different in its effects, as all chemists know. For new tin roofs, we find the following paints to be the most durable, viz:—pure English Venetian red, ochres, Spanish brown, and Canadian burnt sienna. The words "metallic" and "mineral" are terms that are given to most all newly-discovered paints; but they are very indefinite in their meaning, when thus applied. We see no reason why there should be any mystery in this matter, and any impropriety in telling our employers what materials we use, for he who pays for the materials ought to know what he has bought. Ex-mayor Mickle has had his roofs, at Bayside, Flushing, L. I., recently painted with this graphite, which has excited much curiosity, it being considered by many as something new, and likely to supersede all others, in durability, &c.; but such statements are not based upon facts in our long experience in painting and chemistry. This graphite, as an oil paint, is not new, neither is it more durable than the other paints we have mentioned in this article.

Quarterman & Son.

New York, August 29, 1859.

SIMPLE PLAN OF OILING JOURNALS.

Messrs. Editors:—Noticing, in your last number, the engraving and description of a device for oiling journals that are difficult to reach, it calls to mind a plan I adopted some time since; and if it can be of any use to others, they are welcome to it.

When in charge of the Portsmouth (N. H.) Steam Cotton-mill, we had nearly 300 journals in one weaving-room to oil; and as the room was very high, it was quite a job to oil them well, and not waste the oil or drop it on the work below. I found a man doing it by means of a ladder, which was furnished with hooks at the end to hook on to the shaft. With a lazy man, it took the best part of the day; and he was all the time in somebody's way.

I took a piece of one-fourth inch gas-pipe, long enough for a man standing on the floor to reach with it up to the journal, and fitted to it a piece of wood (similar to the stock of a gun-barrel) to stiffen it. At the bottom I attached a small force-pump, with the piston operated by a spiral spring one way, and worked the other way by pulling it with the finger, forcing the oil out at the bent top directly into the cap on the journal, the quantity of oil being regulated by the distance traversed by the piston, and that regulated by a stopper attached. The force-pump may be supplied by a copper vessel of any desired shape or size, similar to an air-gun.

By using this, the oiling could be done in about one hour, saving seven-eighths of the labor, and rendering the operation much more easy to the workman. Then the supply of oil which the bearing receives is always exactly adjusted to the desired quantity, which, by the ordinary process, is seldom done. There are also other advantages which a clean and practical man can appreciate; the shape of the tool enables it to be hung up out of the way; and if the bearing is in a dark place, it is very easy to feel the hole in the cap, and thus oil the journal with certainty.

Edmund Bacon.

Ashburnham, Mass., Sept. 3, 1859.

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A great tobacco sale took place in this city on the 30th ult., and was felt to be a failure, as many articles on the catalogue were withdrawn. One firm alone bought 600 hhds. The lots sold amounted to $750,000.

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